

Tableaux stœchiométriques

Série 3/4 — Équations chimiques et stœchiométrie — Corrigé détaillé (version adulte)

Exercice 1



On donne $m(\text{C}_3\text{H}_8) = 8,82 \text{ g}$.

	C₃H₈	O₂	CO₂	H₂O
Coef. stœ.	1	5	3	4
m (g)	8,82	32	26,4	14,4
M (g/mol)	44,097	31,998	44,009	18,015
n (mol)	0,2	1	0,6	0,8

- $n(\text{C}_3\text{H}_8) = m / M = 8,82 / 44,097 = 0,200 \text{ mol}$.
- Le rapport n / coef vaut 0,200 pour toutes les substances (0,200/1).
- $n(\text{O}_2) = 5 \times 0,200 = 1,00 \text{ mol} \rightarrow m(\text{O}_2) = 1,00 \times 31,998 = 32,0 \text{ g}$.
- $n(\text{CO}_2) = 3 \times 0,200 = 0,600 \text{ mol} \rightarrow m(\text{CO}_2) = 0,600 \times 44,009 = 26,4 \text{ g}$.
- $n(\text{H}_2\text{O}) = 4 \times 0,200 = 0,800 \text{ mol} \rightarrow m(\text{H}_2\text{O}) = 0,800 \times 18,015 = 14,4 \text{ g}$.

Exercice 2



On donne $m(\text{Fe}_2\text{O}_3) = 319,4 \text{ g}$.

	Fe	O₂	Fe₂O₃
Coef. stœ.	4	3	2
m (g)	223	96	319
M (g/mol)	55,847	31,998	159,691
n (mol)	4	3	2

- $n(\text{Fe}_2\text{O}_3) = m / M = 319,4 / 159,691 = 2,00 \text{ mol}$.
- Le rapport n / coef vaut $2,00/2 = 1,00$ pour toutes les substances.
- $n(\text{Fe}) = 4 \times 1,00 = 4,00 \text{ mol} \rightarrow m(\text{Fe}) = 4,00 \times 55,847 = 223 \text{ g}$.
- $n(\text{O}_2) = 3 \times 1,00 = 3,00 \text{ mol} \rightarrow m(\text{O}_2) = 3,00 \times 31,998 = 96,0 \text{ g}$.

Exercice 3



On donne $m(\text{Al}) = 53,96 \text{ g}$.

	Al	O ₂	Al ₂ O ₃
Coef. stœ.	4	3	2
m (g)	54	48	102
M (g/mol)	26,982	31,998	101,961
n (mol)	2	1,5	1

- $n(\text{Al}) = m / M = 53,96 / 26,982 = 2,00 \text{ mol}$.
- Le rapport n / coef vaut $2,00/4 = 0,500$ pour toutes les substances.
- $n(\text{O}_2) = 3 \times 0,500 = 1,50 \text{ mol} \rightarrow m(\text{O}_2) = 1,50 \times 31,998 = 48,0 \text{ g}$.
- $n(\text{Al}_2\text{O}_3) = 2 \times 0,500 = 1,00 \text{ mol} \rightarrow m(\text{Al}_2\text{O}_3) = 1,00 \times 101,961 = 102 \text{ g}$.

Exercice 4

Réaction : $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$

On donne $m(\text{CaO}) = 28,04 \text{ g}$.

	CaO	H ₂ O	Ca(OH) ₂
Coef. stœ.	1	1	1
m (g)	28	9,01	37
M (g/mol)	56,079	18,015	74,094
n (mol)	0,5	0,5	0,5

- $n(\text{CaO}) = m / M = 28,04 / 56,079 = 0,500 \text{ mol}$.
- Les coefficients étant tous égaux à 1, $n(\text{H}_2\text{O}) = n(\text{Ca(OH)}_2) = 0,500 \text{ mol}$.
- $m(\text{H}_2\text{O}) = 0,500 \times 18,015 = 9,01 \text{ g}$.
- $m(\text{Ca(OH)}_2) = 0,500 \times 74,094 = 37,0 \text{ g}$.

Exercice 5

Réaction : $\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$

On donne $m(\text{CO}_2) = 22,00 \text{ g}$.

	Ca(OH) ₂	CO ₂	CaCO ₃	H ₂ O
Coef. stœ.	1	1	1	1
m (g)	37	22	50	9,01
M (g/mol)	74,094	44,009	100,088	18,015
n (mol)	0,5	0,5	0,5	0,5

- $n(\text{CO}_2) = m / M = 22,00 / 44,009 = 0,500 \text{ mol}$.
- Les coefficients étant tous égaux à 1, toutes les substances ont $n = 0,500 \text{ mol}$.
- $m(\text{Ca(OH)}_2) = 0,500 \times 74,094 = 37,0 \text{ g}$.

- $m(\text{CaCO}_3) = 0,500 \times 100,088 = 50,0 \text{ g.}$
- $m(\text{H}_2\text{O}) = 0,500 \times 18,015 = 9,01 \text{ g.}$

Exercice 6



On donne $m(\text{NaHCO}_3) = 84,01 \text{ g.}$

	NaHCO ₃	Na ₂ CO ₃	H ₂ O	CO ₂
Coef. stœ.	2	1	1	1
m (g)	84	53	9,01	22
M (g/mol)	84,006	105,988	18,015	44,009
n (mol)	1	0,5	0,5	0,5

- $n(\text{NaHCO}_3) = m / M = 84,01 / 84,006 = 1,00 \text{ mol.}$
- Le rapport n / coef vaut $1,00/2 = 0,500$ pour les 3 autres substances.
- $n(\text{Na}_2\text{CO}_3) = 1 \times 0,500 = 0,500 \text{ mol} \rightarrow m = 0,500 \times 105,988 = 53,0 \text{ g.}$
- $n(\text{H}_2\text{O}) = 1 \times 0,500 = 0,500 \text{ mol} \rightarrow m = 0,500 \times 18,015 = 9,01 \text{ g.}$
- $n(\text{CO}_2) = 1 \times 0,500 = 0,500 \text{ mol} \rightarrow m = 0,500 \times 44,009 = 22,0 \text{ g.}$

Exercice 7



On donne $m(\text{Zn}) = 6,538 \text{ g.}$

	Zn	HCl	ZnCl ₂	H ₂
Coef. stœ.	1	2	1	1
m (g)	6,54	7,29	13,6	0,202
M (g/mol)	65,380	36,461	136,286	2,016
n (mol)	0,1	0,2	0,1	0,1

- $n(\text{Zn}) = m / M = 6,538 / 65,38 = 0,100 \text{ mol.}$
- Le rapport n / coef vaut $0,100$ pour Zn, ZnCl₂ et H₂ (coef 1) et se double pour HCl (coef 2).
- $n(\text{HCl}) = 2 \times 0,100 = 0,200 \text{ mol} \rightarrow m(\text{HCl}) = 0,200 \times 36,461 = 7,29 \text{ g.}$
- $n(\text{ZnCl}_2) = 0,100 \text{ mol} \rightarrow m(\text{ZnCl}_2) = 0,100 \times 136,286 = 13,6 \text{ g.}$
- $n(\text{H}_2) = 0,100 \text{ mol} \rightarrow m(\text{H}_2) = 0,100 \times 2,016 = 0,202 \text{ g.}$

Exercice 8



On donne $m(\text{AgNO}_3) = 16,99 \text{ g.}$

	AgNO ₃	NaCl	AgCl	NaNO ₃
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Coef. stœ.	1	1	1	1
m (g)	17	5,84	14,3	8,5
M (g/mol)	169,872	58,443	143,321	84,994
n (mol)	0,1	0,1	0,1	0,1

- $n(\text{AgNO}_3) = m / M = 16,99 / 169,872 = 0,100 \text{ mol.}$
- Les coefficients étant tous égaux à 1, toutes les substances ont $n = 0,100 \text{ mol.}$
- $m(\text{NaCl}) = 0,100 \times 58,443 = 5,84 \text{ g.}$
- $m(\text{AgCl}) = 0,100 \times 143,321 = 14,3 \text{ g.}$
- $m(\text{NaNO}_3) = 0,100 \times 84,994 = 8,50 \text{ g.}$

Exercice 9



On donne $m(\text{C}_2\text{H}_5\text{OH}) = 23,03 \text{ g.}$

	C₂H₅OH	O₂	CO₂	H₂O
Coef. stœ.	1	3	2	3
m (g)	23	48	44	27
M (g/mol)	46,069	31,998	44,009	18,015
n (mol)	0,5	1,5	1	1,5

- $n(\text{C}_2\text{H}_5\text{OH}) = m / M = 23,03 / 46,069 = 0,500 \text{ mol.}$
- Le rapport n / coef vaut 0,500 (coef 1 pour l'éthanol).
- $n(\text{O}_2) = 3 \times 0,500 = 1,50 \text{ mol} \rightarrow m(\text{O}_2) = 1,50 \times 31,998 = 48,0 \text{ g.}$
- $n(\text{CO}_2) = 2 \times 0,500 = 1,00 \text{ mol} \rightarrow m(\text{CO}_2) = 1,00 \times 44,009 = 44,0 \text{ g.}$
- $n(\text{H}_2\text{O}) = 3 \times 0,500 = 1,50 \text{ mol} \rightarrow m(\text{H}_2\text{O}) = 1,50 \times 18,015 = 27,0 \text{ g.}$

Exercice 10



On donne $m(\text{Mg}) = 24,31 \text{ g.}$

	Mg	O₂	MgO
Coef. stœ.	2	1	2
m (g)	24,3	16	40,3
M (g/mol)	24,305	31,998	40,304
n (mol)	1	0,5	1

- $n(\text{Mg}) = m / M = 24,31 / 24,305 = 1,00 \text{ mol.}$
- Le rapport n / coef vaut $1,00/2 = 0,500$ pour toutes les substances.
- $n(\text{O}_2) = 1 \times 0,500 = 0,500 \text{ mol} \rightarrow m(\text{O}_2) = 0,500 \times 31,998 = 16,0 \text{ g.}$

● $n(\text{MgO}) = 2 \times 0,500 = 1,00 \text{ mol} \rightarrow m(\text{MgO}) = 1,00 \times 40,304 = 40,3 \text{ g}.$